



**Semester 1 Examinations 2017/ 2018**

<b>Exam Code(s)</b>	4BCT1
<b>Exam(s)</b>	4 <sup>th</sup> Year Examination Computing Science and IT
<b>Module Code(s)</b>	CT421
<b>Module(s)</b>	Artificial Intelligence
<b>Paper No.</b>	1
<b>Repeat Paper</b>	No
<b>External Examiner(s)</b>	Dr. Jacob Howe
<b>Internal Examiner(s)</b>	Dr. M Schukat *Dr. C Mulvihill *Dr. F Smith

**Instructions:** Answer 2 questions from each section. All questions will be marked equally. Use a separate answer book for each section.

<b>Duration</b>	2 hours
<b>No. of Pages</b>	3
<b>Discipline(s)</b>	IT
<b>Course Co-ordinator(s)</b>	

**Requirements:**

MCQ	Release to Library: Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Handout	None			
Statistical/ Log Tables	None			
Cambridge Tables	None			
Graph Paper	None			
Log Graph Paper	None			
Other Materials	None			
Graphic material in colour	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>

**PTO**

## **Section A**

1

(a)

Conventional 'crisp' logic is based on Boolean values (true/false). How does fuzzy logic differ from crisp logic?

(5 marks)

(b)

Can conventional crisp logic be represented in fuzzy logic? Justify your answer.

(10 marks)

(c)

Describe the 3 main steps involved when fuzzy logic is used in a rule based system.

(10 marks)

2

(a)

What are the advantages of Quantitative representation when compared to Qualitative representation. Give an example to illustrate your answer.

(10 marks)

(b)

In Mycin type systems, if the CF for a conclusion X was deduced to be both 0.8 and 0.7, what would be the combined CF?

(9 marks)

(c)

How can the Turing test be used to determine if an AI possesses intelligence?

(6 marks)

3

(a)

How does the search space in AI search differ from the search space in conventional search?

(5 marks)

(b)

Describe the advantages and disadvantages of depth first search. How does depth first search with iterative deepening compare to these two searches?.

(10 marks)

(c)

How can forward chaining and backward chaining be combined to perform a single search?

(5 marks)

(d)

Describe 3 ways that uncertainty could be handled in reasoning systems.

(5 marks)

**PTO**

## **Section B**

4

(a)

Explain what is meant by the term ‘greedy search?’

(7 marks)

(b)

Consider an undirected graph that consists of six vertices (A to F) and six edges as follows: There is an edge between A and B. There is an edge between B and C. There is an edge between C and D. There is an edge between D and E. There is an edge between E and F. There is an edge between F and A. A greedy search is to be used to colour the vertices of this graph. Vertices that are joined by an edge must have different colours. Find one ordering of the vertices where a greedy search will use two colours in total, and another where it will use three colours.

(12 marks)

(c)

An informed search can make use of a heuristic that estimates the distance to go to the goal. Is a heuristic that underestimates the distance to the goal preferable to one that overestimates the distance to the goal in your view?

(6 marks)

5

(a)

In the context of genetic algorithms, explain what is meant by the term ‘roulette wheel selection’ (5 marks)

(b) A genetic algorithm for a software bot (like Mitchell’s Robby) that collects cans in a 10 by 10 two-dimensional array is to be developed. A cell of this array can be empty or contain a can. In terms of context, a bot can see the contents of the current cell, and the contents of one cell north, south, east and west. In terms of actions, a bot can: Move one cell north, south, east, west, move one step randomly (north, south, east, or west), pick up a can in the current cell, or do nothing. A reward should be given if the bot picks up a can in the current cell. However a fine should be applied if the bot’s action is to pick up a can and there is in fact no can in the cell. Discuss the development of a suitable representation in terms of situations and actions for this genetic algorithm (8 marks)

(c) With the representation from 5(b) in place, finish the development of the genetic algorithm (12 marks)

6

“Various visions of AI as an assistant are found with systems like Watson, Semantic Scholar and Alexa” Discuss this statement under the following three headings:

Current state of AI assistants (7 marks), possible futures for AI assistants (10 marks), security issues (8 marks)